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SUPPLY AND RECOVERY SYSTEM FOR MOLDING SAND

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SUPPLY AND RECOVERY SYSTEM FOR MOLDING SAND

[Imonosa no kokyu oyobi kaishu shisutemu]

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[There are no amendments to this patent.]

Claim

A supply and recovery system for molding sand, characterized by the fact that it is equipped with a vacuum casting system in which a suction port of a vacuum pump is connected to an exhaust port of a vacuum tank with a sand separator having a fine-particle sand discharge port, an air suction port, and the above-mentioned exhaust port and an air suction tube for absorbing and discharging a gas in a closed casting flask is connected to the above-mentioned air suction port; an exhaust port of a closed sand-storage tank with a sand separator having a sand supply port, a sand suction port, and the above-mentioned exhaust port is connected to the vacuum tank with a sand separator via an opening and closing means; during the operation of the vacuum pump in which the above-mentioned opening and closing means is opened, along with an air flow from the above-mentioned sand suction port to the above-mentioned closed sand

storage tank, molding sand in the above-mentioned closed casting flask is shaken out, absorbed, separated, and recovered; and the molding sand recovered is jetted and supplied into the above-mentioned closed casting flask from the above-mentioned sand supply port.

Detailed explanation of the invention

Industrial application field

The present invention pertains to a supply and recovery system for molding sand that forms a mold during casting. Specifically, the present invention pertains to a supply and recovery system for molding sand that rapidly recovers molding sand shaken out after casting by utilizing an existing vacuum casting system through a labor-saving process that can supply the recovered molding sand into a flask when reusing it.

Prior art

Molding sand in a closed casting flask shaken out after a vacuum casting is reused in a recovered state. In particular, since the molding sand used in casting in which a disappearing pattern composed mainly of a synthetic resin material as a prototype, which is called a full-mold process, does not include a binder like the general molding sand using a wood mold or metal mold as a prototype, it can be reused in a recovered state.

In such a conventional supply and recovery system for molding sand, shaken-out molding sand is carried to a transferrer such as conveyor, transferred to a sand storage tank such as a hopper by the transferrer, and recovered, and when it is reused, it is dropped into the flask from the sand storage tank.

Problems to be solved by the invention

However, in the above-mentioned conventional supply and recovery system, an operation for drawing the shaken-out molding sand out of the flask and a molding-sand-carrying operation that carries the drawn molding sand to a transferrer, such as a conveyor, are required, and these operations require much labor and relatively long operation time, so that workability is inferior. Furthermore, since the complicated transferrer such conveyor is required, the facility [size] is increased, causing an economic disadvantage.

The present invention considers the problems of the above prior art in which the vacuum casting system has a suction function, and its purpose is to provide a supply and recovery system for molding sand that improves the workability by rapidly recovering the molding sand shaken out after casting through a labor-saving process utilizing the suction function, does not require a complicated device, and can reduce the facility [size].

Means to solve the problems

In order to achieve the above-mentioned objective, the present invention is equipped with a vacuum casting system in which a suction port of a vacuum pump is connected to an exhaust port of a vacuum tank with a sand separator having a fine-particle sand discharge port, an air suction port, and the above-mentioned exhaust port and an air suction tube for absorbing and discharging gas in a closed casting flask is connected to the above-mentioned air suction port. An exhaust port of a closed sand storage tank with a sand separator having a sand supply port, a sand suction port, and the above-mentioned exhaust port is connected to the vacuum tank with a sand separator via an opening and closing means. During the operation of the vacuum pump in which the above-mentioned opening and closing means is opened, along with an air flow from the above-mentioned sand suction port to the above-mentioned closed sand storage tank, molding sand in the above-mentioned closed casting flask is shaken out, absorbed, separated, and recovered, and the molding sand recovered is jetted and supplied into the above-mentioned closed casting flask from the above-mentioned sand supply port.

Operation

In the present invention, with the operation of the vacuum pump of the vacuum casting system by opening the opening and closing means, the molding sand in the shaken-out closed casting flask can be recovered from the sand suction port by the closed sand storage tank, and when it is reused, it can be supplied into the closed casting flask from the sand supply port of the closed sand storage tank.

Application examples

Figure 1 is a system diagram showing an application example of the supply and recovery system for molding sand of the present invention. In the figure, 1 is a well-known vacuum casting system, and a suction port 2A of a vacuum pump 2 is connected via a suction tube 2B to an exhaust port 3C of a vacuum tank 3 with a sand separator having a fine-particle sand discharge port 3A, an air suction port 3B, and the above-mentioned exhaust port 3C. An air suction tube 5 that is installed into a closed casting flask 4 and absorbs and discharges a gas in the above-mentioned closed casting flask 4 through a strainer 5A of the tip is connected to the air suction port 3B, and a valve 6 is installed in the air suction tube 5

7 is a closed sand storage tank with a sand separator, and an exhaust port 7A and the downstream side of the above-mentioned air suction tube 5 are connected by an exhaust pipe 9 in which a valve is installed as an opening and closing means 8. The closed sand storage tank with a sand separator absorbs and introduces the sand shaken out after a vacuum casting in the closed casting flask 4 (i.e., molding sand 10 along with an air flow from a sand suction port 7B via a

sand suction tube 11), separates the sand and the air by a centrifugal force, discharges the air from the exhaust port 7A, drops the molding sand 10 by its own weight, and stores it. A sand supply port 7C is formed at its bottom.

The sand suction tube 11 is constituted by a flexible tube, for instance, and a valve 12 is installed at its tip. The sand supply port 7C is formed in a downward opening shape and has a diameter so that the molding sand 10 recovered and stored in the closed sand storage tank 7 can be smoothly dropped by its own weight, and a valve 13 is installed at the tip.

In the closed sand storage tank 7 with a sand separator, a strainer 14 is installed at a position higher than the sand suction port 7B. Also, at the outer periphery of the tank 3, a cooling means 15 consisting of a water jacket is installed, and a coolant is introduced into the cooling means 15 through a water supply pipe 15a from a coolant supply source, not shown in the figure, and drained from a drainage pipe 15b, so that the molding sand 10 is cooled via the peripheral wall of the closed sand storage tank 7.

16 is a disappearing pattern composed of a polystyrene resin, for instance, and molded into a mold as a prototype. In the figure, 16a is a sprue.

Next, the operation of the above-mentioned constitution is explained. The disappearing pattern 16 molded as a prototype is lost by casting from the sprue 16a, and the cast corresponding to the disappearing pattern 16 is formed in the mold 10. Then, in a state in which the opening and closing means 8 is closed and the valve 6 is opened, the gas included in the mold 10 in the closed casting flask 4 is guided to the vacuum tank 3 with a sand separator through the air suction port 3B from the air suction tube 5 and absorbed and discharged through the suction tube 2B and the suction port 2A from the exhaust port 3C of the tank 3. The strength of the mold 10 is raised by densifying, and the inside of the closed casting flask 4 is held in a prescribed vacuum atmosphere for an appropriate casting by effectively discharging the gas being generated during pouring through the above-mentioned passage.

In this case, the molding sand that forms the mold 10 is prohibited from penetrating the air suction tube 5 by the strainer 5A; however, even if the fine-particle sand penetrate into the air suction tube 5 through the strainer 5A, the fine-particle sand are separated from the air by the centrifugal force when it is absorbed in the vacuum tank 3 with a sand separator. Since only the air separated is absorbed in the vacuum pump 2 from the exhaust port 3C, the vacuum pump 2 is not damaged.

After the above-mentioned cast is cooled, the vacuum pump 2 is stopped, the upper lid of the closed casting flask 4 is opened, and the cast is drawn out by shaking-out for disassembling the mold 10. Then, the valve 6 is closed, the opening and closing means 8 is opened, and the sand suction tube 11 is inserted into the closed casting flask 4 by re-operating the vacuum pump 2. Thus, along with the air flow, the shaken-out molding sand 10 is absorbed in the closed sand

storage tank 7 from the sand suction port 7B and circled within it, and the molding sand 10 and the air are separated by the centrifugal force. Then, the air is passed through the strainer 14, absorbed in the vacuum tank 3 with a sand separator through the exhaust pipe 9 from the exhaust port 7A, pass through the above-mentioned air passage, absorbed in the suction port 2A of the vacuum pump 2, and exhausted to the atmosphere from a jet port 2C. Also, the molding sand 10 including the particulates caught by the strainer 14 is dropped into the bottom of the closed sand storage tank 7, recovered, and stored.

When all the molding sand 10 in the shaken-out closed casting flask 4 is recovered, the valve 12 is closed, and the vacuum pump 2 is stopped.

Since the outer periphery of the closed sand storage tank 7 with a sand separator is cooled by the cooling means 15, needless to say, the molding sand 10 recovered in the sand storage tank 7 is cooled rapidly by a heat-exchange action. Therefore, it is cooled to a temperature at which the molding sand is reusable in a short time, that is, a temperature at which the prototype can be held without collapsing the disappearing pattern 16 being used as the prototype by the temperature rise. For this reason, the cycle time of the casting operation can be considerably shortened.

In case the above-mentioned molding sand 10 recovered and lowered to a prescribed temperature is reused, the valve 13 of the sand supply port 7C may be opened. With the opening of the valve 13, the molding sand 10 is jetted and supplied into the closed casting flask 4 opened from the sand supply port 7C by a natural drop and reused as a mold.

Since the sand component is completely removed from the air being exhausted from the exhaust port 7A of the closed sand storage tank 7 with a sand separator, the vacuum pump 2 is not damaged. Needless to say, as mentioned above, for example, a Y-type strainer 14A may also be installed in the exhaust pipe 9 as shown by an imaginary line instead of the strainer 14 installed in the closed sand storage tank 7. With this constitution, the maintenance and check is simpler, compared with the strainer 14, so that clogging is easily prevented.

Figure 2 is a systematic diagram showing another application example of the present invention. The same symbols are given to the same or corresponding parts as those of the above-mentioned application example, and their explanations are omitted. In this application example, the exhaust port 7A of the closed sand storage tank 7 with a sand separator is directly connected to the vacuum tank 3 with a sand separator via the exhaust pipe 9. With this connection constitution, operations and effects similar to those of the above-mentioned application example are also exerted.

Also, as shown in Figure 3, operations and effects as those of the above-mentioned cooling means 15 are also exerted by the cooling means 15 with a constitution in which a coolant

pipe is spirally disposed in the closed sand storage tank 7 with a sand separator, especially in the part in which the molding sand 10 is stored.

Effect of the invention

According to the present invention, the exhaust port of the closed sand storage tank with the sand separator having the sand supply port, the sand suction port, and the above-mentioned exhaust port is connected to the vacuum tank with a sand separator via the opening and closing means. During the operation of the vacuum pump in which the above-mentioned opening and closing means is opened, along with an air flow from the above-mentioned sand suction port to the above-mentioned closed sand storage tank, molding sand in the above-mentioned closed casting flask after being shaken out are absorbed, separated, and recovered, and the molding sand recovered are jetted and supplied into the above-mentioned closed casting flask from the above-mentioned sand supply port. Thus, unlike the conventional supply and recovery system for molding sand, many operations were not required, and the molding sand can be rapidly recovered by one person, so that workability is markedly improved. Also, since an existing vacuum casting system is utilized and a complicated special molding sand transferrer such as conveyor is not required, the facility cost is reduced, resulting in an economic advantage.

Brief description of the figures

Figure 1 is a systematic diagram showing an application example of the present invention, Figure 2 is a systematic diagram showing another application example of the present invention, and Figure 3 is an illustrative diagram showing another application example of a cooling means.

1 Vacuum casting system
2 Vacuum pump
2A Suction port
3 Vacuum tank with a sand separator
3A Fine-particle sand discharge port
3B Air suction port
3C Exhaust port
4 Closed casting flask
5 Air suction tube
7 Closed sand storage tank with a sand separator
7A Exhaust port
7B Sand suction port
7C Sand supply port

8 Opening and closing means

10 Molding sand

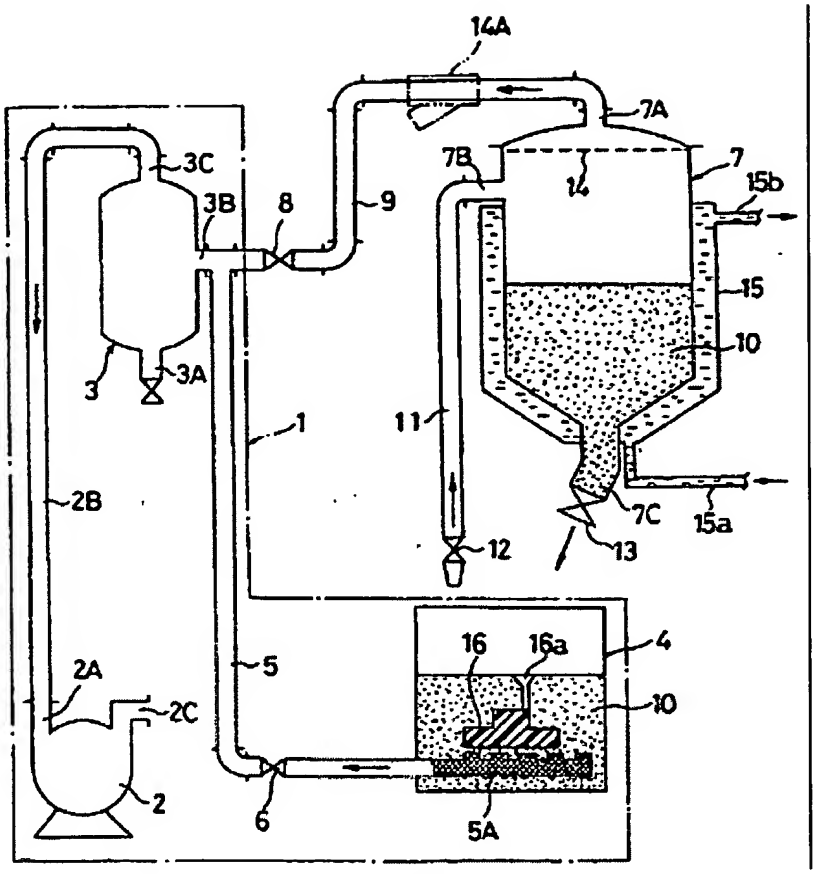

Figure 1

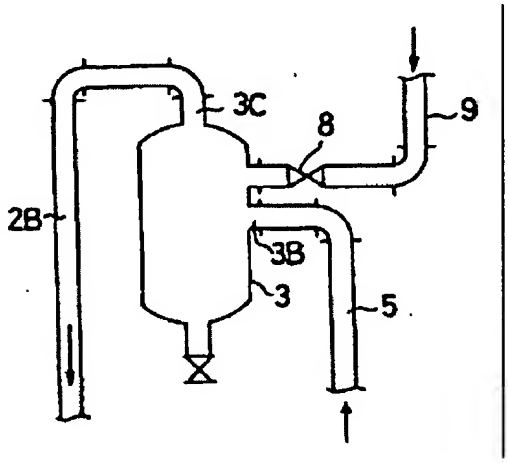

Figure 2

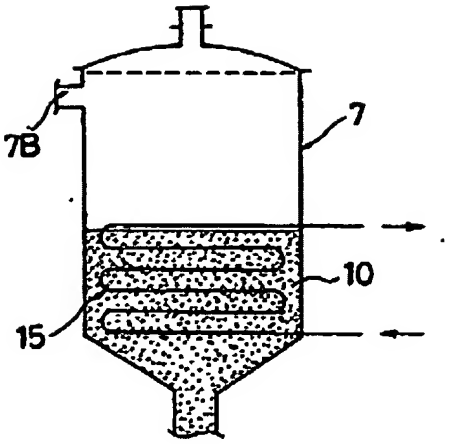

Figure 3